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ABSTRACT

An Estimated Model of the German Magazine Market

by Ulrich Kaiser*

I derive and estimate a model for profit maximization of German magazines. Quarterly data on German women's magazines observed between 1998 and 2001 are used in the econometrics. Main empirical results are that magazines with particularly circulation-sensitive advertising prices set cover prices below marginal cost and there are large and highly significant returns to scale and scope in production.

Keywords: Magazine, cost estimation, GMM estimation

JEL Classification: L11, C33

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ZUSAMMENFASSUNG

Ein geschaetztes Modell für den deutschen Zeitschriftenmarkt

Diese Arbeit entwickelt und schätzt ein Modell für die Gewinnmaximierung deutscher Zeitschriften. In der ökonometrischen Analyse werden vierteljährliche Daten des Zeitraums 1998 bis 2001 verwendet.

Es zeigt sich, dass die Preise von Zeitschriften, deren Anzeigenpreis besonders stark auf Veränderungen in der verkauften Auflage reagieren, deutlich unter den Produktionskosten liegen. Zudem finden sich grosse und hochsignifikante Skalenerträge.

1 Introduction

Print media markets have a unique feature that makes them different from other product markets: a profit–maximizing print medium must take *two* type of consumers on board, readers and advertisers. Advertisers value circulation so that advertising demand and magazine demand are related (and to the extent that readers have a (dis–) taste for advertising, they are interrelated). Such a relatedness in demand has important consequences on print media pricing since an increase in cover prices leads to a decrease in magazine demand which in turn induces a reduction in advertising revenues.

Existing studies have acknowledged these dependencies between the two market sides (Blair and Romano 1993; Bucklin et al. 1989; Chaudhri 1998; Corden 1952–1953; Dertouzos and Trautman 1990; Dewenter and Kraft 2001; Ferguson 1983; Merrilees 1983; Rosse 1967,1970; Thompson 1989) but the theoretical and empirical work that has been produced so far does not meet well with a specific feature of the German magazine market: advertising prices ("advertising rates") are published by the magazines every other fall for the respective entire upcoming year. The two most important factors that influence advertising prices are magazine circulation and the extent to which a magazine targets an advertiser's focus audience. Magazines hence do not have direct command over advertising volume as in most of the studies I cite above. They rather influence advertising prices by adjusting cover prices such that the sum of profits from selling magazines and from selling advertising pages is maximized.

The fact that setting "high" cover prices is very likely to lead to a cannibalization of advertising rates in turn implies that even a magazine monopolist would never set marginal revenue from magazine sales equal to marginal cost of magazine production as a monop-

olist in a "traditional" market would do (as long as advertisers care about circulation). The same rationale applies to newspapers so that it is therefore puzzling that a recent German high profile merger case in the newspaper industry was blocked since the merger would have led to a dominant position of the merging parties in a regional newspaper market. The argumentation of the German monopoly commission did not, however, contain a thorough discussion of the possible negative feedbacks of the expected (by the federal authorities) anticompetitive cover pricing behavior on advertising revenues.[1] The German monopoly commission also rejected the merging parties' cost efficiencies arguments.

In this paper I show that (i) magazines may have strong incentives to charge cover prices *below* marginal cost and that (ii) that there are very sizeable economies of scale and scope effects in magazine production that indicate strong incentives to merge on efficiency grounds.

I derive a model of profit maximization in the German magazine industry that comprises of a behavioral equation for advertising rates, a magazine demand equation and a first order condition for profit maximization (from which I back out estimates for marginal cost). The theoretical model predicts that only a monopolist magazine whose advertising clients have no taste for circulaton charges 'true' monopoly cover prices and that increases in market power would never lead to price increases as high as in traditional one–sided markets. The rationale behind this is simple: a cover price increase cannibalizes advertising revenue. Magazines might even price below marginal cost if advertisers are particularly circulation elastic. These results clearly do not make a case for strong incentives to merge for pure market power reasons. I cannot rule out, however, that there

[1]Details of this merger (Georg von Holtzbrinck and Berliner Verlag) are available on the internet at http://www.monopolkommission.de/sonder.htm. The documentation is available in German only.

a incentives to merge from a potential increase in bargaining power in advertising rate negotiations. Given the fierce competition advertisers face from other media markets (the internet, free papers, radio broadcasting, TV etc.) this does not seem to be particularly likely.

I estimate my model using detailed quarterly data on German women's magazines observed in the period I/1998 to IV/2001. Attention is restricted to women's magazines because this is the hardest fought segment of the German magazine market.[2] The general benefit form restricting attention to a single subsegment of the magazine market is that estimation results can be displayed and discussed for individual magazines, an issue that is especially valuable with respect to the internal and external validation of the estimation results.

A somewhat natural test of my model is to use the marginal cost estimates and validate them internally and externally. I find that they meet reality quite well which suggests that my model might not be too far off reality.

Main results of the paper are that (i) only a monopolist magazine whose advertising prices do not at all depend on circulation charges "true" monopoly cover prices, (ii) cover price increases cannibalize advertising revenue, (iii) the more circulation elastic advertising rates are (and the higher advertising revenue per copy is) the lower is the price–cost margin and (iv) many magazines — those whose adverting rates are particularly circula-

[2]In 2001, 39 women's magazines titles are published, more than twice as much as in the second–densely populated segment, TV magazines. Market concentration, as measured by the Hirshman–Herfindahl index, is much lower in women's magazines than in any other segment, and this is true both in the magazine demand and in the advertising demand dimension. Women's magazines also possess the largest overall market shares in terms of circulation and advertising demand.

tion elastic — have negative estimated price–cost margins. My finding generally indicate low incentives to merge due to chances of price increases in the magazine market and that there exist efficiency gains in the sense of Röller et al. (2000).

2 The model

2.1 Earlier studies

There is an abundant literature on print media industries that started with the diagrammatic exposition of the newspaper firms' profit maximization problem by Corden (1952–1953), who was the first to formally analyze the relationship between advertising sales and circulation. Later studies, to a large extent motivated by the occurrence of "one–newspaper cities" in Australia (Merrilees 1983, Chaudhri 1998) and the US (Blair and Romano 1993; Bucklin et al. 1989; Dertouzos and Trautman 1990, Rosse 1978) and by a generally increasing degree of industry concentration (Ferguson 1983; Reddaway 1963; Thompson 1989), were concerned with the effects of concentration on the newspaper market. By and large, these studies find that competitive concerns are weakened by the fact that the newspaper firms' pricing behavior is restricted by the feedback of newspaper pricing to the advertising market.

The model introduced below explicitly takes the relationship between magazine sales and advertising demand into account. Unlike the aforementioned studies which assume that print media firms have command both over the magazine market *and* the advertising market, my model comes with — consistent with the institutional settings of the magazine market — a behaviorial equation for advertising prices, an equation for magazine demand and a first–order condition for profit maximization (where magazines set cover prices).

2.2 Inverse demand for advertising

My specification of inverse demand for advertising is mainly based on industry observation and conversations I had with industry professionals, both from the advertiser and the magazine side. According to these interviews there are two key criteria that make magazines attractive for advertisers: (i) the extent to which the magazine hits the advertiser's target audience and (ii) circulation.

Additional theory–building guidance comes from the fact that advertising rates for the upcoming year are published in fall of the respective present year. Advertising rates then remain unchanged the entire next year. This property of zero within variation in a single year is shown in Table 1 that displays the within and between variation of key variables that are used in the estimations for the year 2001.[3]

Insert Table 1 about here!

Sticking the two most important ingredients of advertising rate determination together with the price–fixing mechanism leads to the following behaviorial equation for advertising rates:

$$p^a_{jt+1} = \lambda_{jt} E[q_{jt+1}]^{\eta} \tag{1}$$

where p^a_{jt+1} denotes the price per advertising page of magazine j set for time $t+1$ (at time t), λ is a scalar that links features of magazine j and it's readership characteristics (target

[3]There is zero within variation in advertising rates as expected and there is also very little variation in the other key variables which makes fixed effects estimation very unattractive.

audience characteristics) to advertising price (these characteristics change very little over time so that there is no need to form expectations) and $E[.]$ is denotes the advertisers' expectations about future circulation. Consistent with my insights from interviews with industry representatives, I assume adaptive expectations:

$$p^a_{jt+1} = \lambda_{jt} q^{\eta}_{jt} = \lambda_{jt}\big(M_t s[\boldsymbol{p^c_{jt}}, \boldsymbol{x_{jt}}, \boldsymbol{\xi_{jt}}, \boldsymbol{\theta}]\big)^{\eta}, \tag{2}$$

where $q_{jt} = M_t s[.]$ denotes total circulation at time t, M_t denotes market size (my measure of market size is the total number of women aged above 14 years in Germany), $s[.]$ denotes the market share of a magazine which depends on the cover price of all magazines active in the market, $\boldsymbol{p^c_{jt}}$, observed quality characteristics, $\boldsymbol{x_{jt}}$, and unobserved quality characteristics, $\boldsymbol{\xi_{jt}}$. The vector $\boldsymbol{\theta}$ consists of parameters relating the observed quality characteristics to magazine demand, $\boldsymbol{\beta}$, the parameter corresponding to magazine price, α, and the correlation coefficient of within–group utility correlation, σ (which is discussed below).

The parameter η is the circulation elasticity of advertising rates: the larger η, the more elastic are advertising prices with respect to circulation.

My formulation of inverse demand for advertising is the same as in Berry and Waldfogel (1999). It is also consistent with perfect competition on the advertising market. Parameter λ is assumed to depend upon a vector of observed variables that influence advertising prices, for example readership characteristics and magazine characteristics, summarized by vector $\boldsymbol{w_{jt}}$, and an unobserved (to the econometrician) component that is denoted by ψ_{jt}:

$$\lambda_{jt} \;=\; exp(\boldsymbol{w_{jt}\theta} + \psi_{jt}). \tag{3}$$

My specification of inverse demand for advertising is more flexible than that of Berry and Waldfogl (1999) since I allow the circulation elasticities to be different for different product groups. It, for example, appears obvious that advertising rates in fashion magazines such as "Elle" and "Vogue" are less circulation elastic than in weekly entertaining magazines with a broad topic variety. My inverse demand for advertising specification hence is:

$$p^a_{jt+1} = \lambda_{jt} \prod_g (M_t s[p^c_{jt}, \boldsymbol{x_{jt}}, \xi_{jt}])^{D_g \eta_g} = \lambda_{jt} \ (M_t \ s[.])^{\sum_g D_g \eta_g}, \tag{4}$$

where D_g denotes a dummy variable that is coded one if magazine j is in group g and zero otherwise.

I have also tried an alternative formulation of inverse demand for advertising of the following form:

$$p^a_{jt+1} = \lambda_{jt} \ (M_t \ s[.])^{\sum_g D_g \eta_g} \ ADP_{jt}^{-\delta}, \tag{5}$$

where ADP_{jt} denotes the number of advertising pages in magazine j at time t. The only difference to Equation (4) is that advertising pages, ADP are explicitly considered. It is to be expected that δ is negative meaning that advertisers have a distaste for advertising pages since their own ad could, for example, be overlooked.[4] As it will turn out later, however, the coefficient on advertising pages is insignificantly different from zero so that the econometric analysis does not support an inverse advertising specification as in Equation 5. In other words, the estimation results do not provide evidence for an interrelated magazine market.

[4]Note that all magazines in my data have more than one advertising page so that the undesirable property that $lim_{ADP_{jt} \longrightarrow 0} p^a_{jt} = \infty$ is not an issue here.

2.3 Magazine demand

Magazine demand is specified by a "nested logit" functional form (Berry 1994). The baseline idea here is to place products into different groups such that products within a group are similar to one another and products of different groups are dissimilar. The correlation between magazines within the same group is represented by parameter σ, a parameter that is to be estimated. By differentiating between products of different groups, a gain in flexibility compared to the standard logit–type model of differentiated products demand (Anderson et al. 1992) is obtained since own–price and cross–price elasticities no longer only depend on own market shares but also upon within–group market shares and the correlation coefficient σ. The nested logit model nests the simple logit approach in the correlation coefficient σ: if $\sigma = 1$, products are perfect substitutes within groups and if $\sigma = 0$, products are symmetric and the standard logit model is obtained.

A shortcoming of the nested logit demand model is that own–price elasticities now depend upon total market share, within group market shares as well as the parameters α and σ only. Although this certainly is a shortcoming I think that the nested logit model might in fact work very well for my market. The magazines that I study are very much alike *within groups* if one compares for example content pages, advertising pages and magazine content shares (the share of e.g. beauty, fashion, wellness etc. pages). By contrast, for example a fashion page of a magazine from the "monthly high priced" magazines looks very different even from a fashion page of a magazine from the "monthly medium priced" magazines. This suggests that being a member of one of the six magazine groups is an important quality characteristic of a magazine. It hence seems worthwhile to use the nested logit model based on this grouping in the econometric analysis since the nested

logit model places random coefficients on dummy variables for the six magazine.

In order to introduce some additional flexibility in the own–price and cross–price elasticity without giving up the simplicity of the nested logit specification I make them dependent on magazine the purchasers income following for example Slade (forthcoming).

The nested logit model for differentiated product demand is well described in the existing literature so that there is no need to go into great details here.[5] Relative demand for magazine j at time t is given by:

$$(6) \qquad ln(s_{jt}) \; - \; ln(s_{0t}) = \boldsymbol{x_{jt}\beta} + \alpha_{jt} p^c_{jt} + \sigma ln(\bar{s}_{j|g}) + \tau_t + \xi_{jt},$$

where $\bar{s}_{j|g}$ denotes the market share of magazine j at time t in magazine group g and τ_t denotes demand shocks that are the same for all magazines. The market share of the outside good, s_0, is $s_0 = 1 - \sum_j s_{jt}$. Own–price and cross–price elasticities are dependent on a magazine's consumer characteristics by making the parameter α_{jt} a function of magazine j's purchaser characteristics at time t. Specifically, I assume that $\alpha_{jt} = \sum_{k=1}^{6} \alpha_k$ Share of consumers from income group k, where the income groups are consumers an income of less than 1,500 DM, between 1,500 DM and 2000 DM, between 2,000 DM and 2,500 DM, between 2,500 DM and 3,000 DM and higher than 3,000 DM.[6] The product grouping, in the present case the grouping of the women's magazines, is very

[5]Note that the logit demand type framework allows consumers to purchase more than one magazine as long as the magazine purchase decision is uncorrelated with the number of magazines bought (Rysman 2002).

[6]I also experimented with household income instead of magazine reader income but obtained implausible results, for example upward sloping demand curves. My explanation for this is that according to Deutscher Hausfrauen Bund (2003) many housewifes (and possibly also househusbands) — the likely consumer of women's magazines — are unaware of their partner's income so that they give wrong assessments of their household income.

important to the nested logit model by construction. My grouping of women's magazines follows industry convention, for example Jahreszeitenverlag (1996–2002), so that I am inclined to believe that it is an appropriate classification of the magazines. In Table 2 I show some main figures about the six magazine groups I use. There are very distinct differences between groups (but a lot similarities within groups, not shown in the table) regarding circulation, circulation revenue (circulation time copy price), advertising and advertising revenue (advertising pages times advertising rates). Magazine groups that have a large market share, for example 'Weekly advise giving magazines' do not necessarily posses large shares in the advertising markets. This emphasizes the importance of targeting 'valuable' (to the advertisers) audiences.

Insert Table 2 about here!

2.4 Profit maximization

Magazine j's profit function is given by:

$$\Pi_{jt} = (p^c_{jt} - mc_{jt})M_t s[.] + p^a_{jt} ADP_{jt} - F_{jt}, \tag{7}$$

where mc_{jt} denotes marginal cost of producing one copy of magazine j at time t, ADP denotes the number of advertising pages and F denotes fixed production cost.

Magazines are assumed to set cover prices in order to maximize profits, at least in the medium run. In the short run magazines try to choose a demand–optimization 'opener', a catchy title story. Such an optimization behavior can, however, hardly be analyzed by an economic study since title choice is hard to measure and the title story success is stochastic even to the magazines themselves.

Copy price setting might also seem to be inconsistent with the low within variation of copy prices as shown in Table 1. The low within variation of copy prices is, however, due to the fact that magazines very rarely change prices within a year. If they do change prices, they change them to a considerably large extent, an issue that is underscored by Table 3.

Insert Table 3 about here!

Note that finding the optimal price depends not only on the revenue from copy sales, but also on advertising sales, which depends on number of copies sold. The following first–order condition for profit maximization then is:

$$\frac{\partial \Pi_{jt}}{\partial p^c_{jt}} = M_t s[.] + M_t(p^c_{jt} - mc_{jt})\frac{\partial s[.]}{\partial p^c_{jt}} + \frac{\partial p^a_{jt}}{\partial p^c_{jt}} ADP_{jt} = 0 \tag{8}$$

Rearranging terms and using the specification for inverse advertising demand as in Equation (4) leads to the following magazine markup decomposition:

$$p^c_{jt} - mc_{jt} = \underbrace{-\frac{p^a_{jt} ADP_{jt}}{M_t s[.]} \sum_g \eta_g D_g}_{\substack{(-) \\ \text{markup} \\ \text{deterioration}}} \quad \underbrace{-\frac{s[.]}{\partial s[.]/\partial p^c_{jt}}}_{\substack{(+) \\ \text{`usual'} \\ \text{markup}}}, \tag{9}$$

where the markup deterioration is the change in advertising revenue that is caused by a cover price change.

Cover prices hence deviate from the usual price–equals–marginal–cost–plus–a–markup formula of traditional oligopoly models by a markup deterioration that depends upon the circulation elasticity of advertising demand, η, and advertising revenue per copy,

$p^a_{jt} ADP_{jt}/(M_t s[.])$: the less circulation–elastic advertising demand (given advertising revenue per copy) and the higher advertising revenue per copy, the larger the markup deterioration. Magazines hence cannibalize cover prices in order to increase advertising sales (unless $\eta = 0$ and/or they do not sell ads). Marginal cost might even exceed cover prices if advertising demand is very circulation elastic and/or if magazines make large revenues from advertising sales. Below marginal cost pricing is a well documented phenomenon in the newspaper industry (Blair and Romano 1993; Wagner 1981) and it also turns to be present for some segments of the German women's magazines market.

3 Data and empirical specification

3.1 Data

My data set comprises of quarterly information on all German women's magazines that existed between the first quarter of 1996 and the fourth quarter of 2001. The minimum number of magazines per period is 38, the maximum is 41. A total of 860 observations is used in the estimation. Data on circulation, cover prices, editorial pages and advertising pages were downloaded from the internet at http://medialine.focus.de. This data has been updated quarterly since 1972 and is continuously recorded. The original source of this information is 'Information Association for the Determination of the Spread of Advertising Media' ('Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V', IVW). IVW ascertains, monitors and publishes circulation and magazine dissemination information.

This data is enriched by annual information on magazine contents that I received from the

publishing house 'Jahreszeitenverlag' (Jahreszeitenverlag 1996–2002). Jahreszeitenverlag distinguishes between 22 different contents.

This information on magazine characteristics is supplemented by data on magazine reader characteristics that was provided to me by "Arbeitsgemeinschaft Media–Analyse" (AG.MA), an association of the German advertising industry for the research of mass communication. The purpose of the AG.MA is to gather and supply data for media audience measurement. The original source of the AG.MA data is consumer survey that is annually collected by the "Institut für Demoskopie, Allensbach", Germany. Around 20,000 interviews are realized year by year.[7]

3.2 Empirical specification

Advertising price shifters (elements of $\boldsymbol{w_{jt}}$)

Elements of the vector of magazine and consumer characteristics $\boldsymbol{w_{jt}}$ that affect advertising rates are (i) a set of group dummies that represent advertising rate premia advertisers have to pay for advertising in a magazine in a respective magazine group, (ii) the natural logarithm of the total number of advertising pages to take into account advertisers' (dis–) utility from other advertisers'placements, (iii) the shares of readers with an own income in the ranges 1,500–2,000 DM, 2,000–2,500 DM, 2,500–3,000; more than 3,000 DM and no own income (base income group: own income less than 1,500 DM) to capture advertisers' taste for consumers with different income, (iv) the Hirshman–Herfindahl index of income concentration to consider advertisers' taste for a "income concentrated" audience, (v) the share of readers in age groups 20–29, 30–39, 40–49, 50–59, 60–69 and more than 70 years of

[7]For more information on this data, see http://www.awa-online.de/.

age (base age group: less than 20 years of age), (vi) the Hirshman–Herfindahl index of age concentration to consider advertisers' taste for an "age concentrated" audience, (vii) the content share of the following topis: fashion for purchase, self–made fashion, cosmetics, cooking, interior design, handicraft, children, society, partnership, vacation, counselling, hobby, car, politics, science, art, sensation, fiction, sexuality, TV, service page of the editors (base content share: health) to represent advertisers' taste for certain contents, (viii) the Hirshman–Herfindahl index of content concentration to consider advertisers' taste for an 'content concentrated' magazine and (ix) a set of year dummies (base year: 1996) to represent shocks common to all magazines (for example business cycle effects).

Since advertising rates change only annually, I annualize my initially quarterly data for the estimation of my behaviorial equation for advertising rates.

Magazine characteristics (elements of $\boldsymbol{x_{jt}}$)

Elements of the vector of magazine and consumer characteristics $\boldsymbol{x_{jt}}$ that affect magazine demand are (i) the natural logarithm of the number of content pages and its square (since there might be disutilities from content pages if they become too many) which is a 'natural' magazine characteristic to include, (ii) the share of advertising pages in total number pages and its square to account for consumer preferences regarding advertising intensity, (iii) the same set of content share variables as in the advertising equation which is again a natural ingredient in a magazine demand specification, (iv) content share concentration and square, (v) the same set of year dummy variables as in the advertising equation and (vi) a set of quarter dummies (base quarter: 4th quarter)

Other ingredients of the magazine demand specification are magazines' cover prices, p^c_{jt} and within group market shares, $\bar{s}_{jt|g}$. Both variables are endogenous and need to be instrumented. They are endogenous since both consumers and producers know the unob-

served (to the econometrician) magazine quality component ξ_{jt}. Producers take its value into account in its pricing decision which in turn induce a positively correlation between ξ_{jt} and magazine cover price p_{jt}. This leads to a downward bias in the parameter estimates that correspond to the price coefficients α_{jt}, calling for an instrumentation of cover prices. By the same token, within group market shares need to be instrumented as well. I follow an idea of Hausman et al. (1994) and use cover prices of magazines from other markets as additional instruments. I construct three different instrument sets based on this idea: (1) the average cover price across all magazines published in Germany, (2) the average cover price across all women magazines and (3) the average cover price across magazines in the own magazine group. Instruments (2) and (3) were rejected by tests for overidentifying restrictions so that instrument set (1) is used in the empirical analysis only. I will henceforth call it the "main cover price instrument" since I use additional variables as instruments for price.

It is well documented that (functions of) other products' (other magazines) characteristics are valid instruments for prices and within group market shares since the pricing equation associated with differentiated product demand models depend on the characteristic of the other products. Existing studies have used the means of the characteristics of other products as instrument for product prices and the means of the characteristics of products from the own product group as instruments for within group market shares (e.g. Verboven 1996). I follow this approach and use the following variables as instruments for cover prices and within group market shares ("overall" means the entire German magazine market): (i) the own advertising pages share relative to mean overall advertising share, (ii) the own advertising pages share relative to mean overall advertising share within the own product group, (iii) the own content concentration index relative to the mean overall

content concentration index, (iv) the own number of pages relative to the mean overall number of pages, (v) the main cover price instrument, (vi) the main own price instrument relative to mean overall main own price instruments and (vii) the ratio of the main own price instrument relative to the main own price instrument from the own product group. Note that the instruments that are defined on the group–level basis are thought as instruments for within group market share while the instruments defined for the entire German magazine market are thought as instruments for cover prices. The distinction does not really matter, however, since in practice instruments for cover prices are also used as instruments for with group market share and vice versa.

For an instrument to be valid it has to have two properties: (i) there must be a high correlation between the instruments and the variable to be instrumented and (ii) the instruments and the residual of the estimation equation of interest must be uncorrelated. In order to check the first property I have run auxiliary OLS regressions of the instruments and the exogenous variables on cover prices and within group market shares (a so–called "first stage reduced form estimation"). The instruments were jointly highly significant in these auxiliary regression indicating a high correlation between the instruments and the variables to be instrumented. The second property, the non–correlation between the residuals and the instruments, is tested by J–tests. Orthogonality of the instruments cannot be rejected in any specification. In addition, I ran OLS regression of instruments on the residuals and do not even find evidence for correlation of one of the instruments with the residuals.

As a final remark on identification in logit–type differentiated product demand models, note that using fixed effects to identify the unobserved magazine characteristics is infeasible since the vector of unobserved product characteristics (the errors) is not identified

separately from the product characteristics (Berry 1994).

Cost components

Marginal cost are backed out from Equation (9) as $mc_{jt} = p^c_{jt} + \frac{p^a_{jt} ADP_{jt}}{M_t s[.]} \sum_g \eta_g D_g + \frac{s[.]}{\partial s[.]/\partial p^c_{jt}}$ using the estimated values for η_g and $\frac{s[.]}{\partial s[.]/\partial p^c_{jt}}$ so that estimating an equation for marginal cost is not needed to identify the model. Regressing marginal cost on factors that are likely to affect them might, however, be instructive with respect to cost savings due to returns to scale and scope in production.

To derive an estimable marginal cost equation I need a functional form assumption for marginal cost. To guarantee positivity, I define $mc_{jt} = exp(\boldsymbol{z_{jt}\gamma} + w_{jt})$. Elements of $\boldsymbol{z_{jt}}$ are (i) scale effects, (ii) scope effects, (iii) 'true' cost drivers and (iv) shocks common to all magazines; the term w_{jt} denotes cost drivers that are unobserved to the econometrician.

(i) *Scale effects* are captured in my specification by total circulation a magazine.[8] It is well known that producing one magazine copy is extremely cost but that cost decrease enormously in circulation (Wagner 1981). Additional scale economies might exist through the size of the publishing house: the larger a publisher is, the cheaper is the production of a magazine. I therefore include the total number of pages produced by a magazine's own publishing house as an additional variable that captures scale economies. These indeed are the type of scale economies merging publishers cite so they should be significantly negative in the estimation for their argument to be valid.

(ii) *Scope effects* are captured by the total number of magazines published by the own pub-

[8] An alternative specification also included squared circulation and yielded a large and negative coefficient coefficient on the linear term and a small and positive coefficient coefficient on the quadratic term. The implied minimal marginal cost were, however, far outside the relevant circulation range.

lishing house and it square. These variables are included since multi magazine publisher might have production advantages because they have more flexible production technologies at their disposal since for example the printing machines might be able to handle different paper qualities and size so that adjustments can be made at low cost. This can at same point also be a disadvantage since there is less specialization which is why the squared term is included. Significantly negative effects the number of pages printed by the own publishing house on marginal cost indicate cost efficiencies that might arise from mergers.

(iii) *'True' cost drivers* are the following factors: (a) the natural logarithm of fashion pages (which is included since fashion pages might be more expensive to produce than other pages due to the coloring), (b) the natural logarithm of physical magazine size (length times width) which is a paper cost driver, (c) the total number of pages which is another paper cost driver and (d) a dummy variable for offset as well as another dummy variable for photogravure print (with a 'mixed' printing technique being the comparison group). Deep print is the printing technique with lowest marginal cost (and highest sunk cost).

Estimation technique

I estimate the inverse demand for advertising equation, the magazine demand equation and the marginal cost equation separately one after the other. The reason for doing the less efficient equation–by–equation estimation is that the difference in data periodicity.[9]

[9]Note that equation–by–equation is inefficient if there is correlation between the error terms of the three equations. The parameters are, however, still consistently (or — very loosely speaking "correctly") estimated. My parameter estimates for the α's and σ — where joint estimation might increase precision — are highly significant even in separate estimation. Moreover, a misspecification of any one equation contaminates the estimation results in all other other equations in simultaneous estimation.

Advertising prices are set annually and are conditioned on the total performance of the magazine in the current year so that I annualize the originally quarterly data. My magazine demand equation is based on quarterly data and so is the marginal cost equation. The way I proceed is to first estimate the equations for advertising rates and magazine demand and then substitute the parameter estimates for η, α_j and σ into the first order condition for profit maximization, Equation (9), from which I back out the estimate for marginal cost.

The advertising rate equation, Equation (4) and the marginal cost equation, Equation (9) are estimated by OLS. The magazine demand equation, Equation (6), is estimated by GMM using the instruments for cover price and within group market shares as described above. All variance covariance matrices are robust to autocorrelation and heteroscedasticity.

Descriptive statistics of the variables involved in the estimations are displayed in Appendices A–C.

4 Results

4.1 Advertising price equation

Estimation results for the advertising rate equation are shown in Table 4. There are substantial differences in the circulation elasticities of advertising rates between magazine groups. Monthly high priced women's magazines such as 'Elle' or 'Vogue' are by far most circulation inelastic which is consistent with what one would expect a priori. By contrast, the differences in circulation elasticities are much less pronounced for the other magazine groups.

Consistent with a priori expectations, advertisers in monthly high priced magazines also have to pay a premium of 600 percent relative to advertising in the biweekly classical magazine while advertisers in yellow magazines pay 280 percent less.

Advertising rates are unaffected by the total number of advertisements placed in a magazine so that advertisers are not afraid of an overlooking of their advertisement. The number of content pages has a significantly positive effect indicating that advertisers value magazine quality.

The income share variables are jointly significant at the 12.6 percent marginal significance level only. Income concentration also is insignificantly different from zero, suggesting that the income of a magazine's audience does not play a key role in advertising rate determination.

Quite the opposite is the case for the age share variables: advertisers significantly value if a magazine's readership, the age share variables are jointly highly significant, and if it is concentrated in age.

Both content shares and content shares concentration play a highly significant role in advertising price determination. The set of 21 content shares is jointly highly significant and so are the variables for content concentration and its square. Interestingly, the linear term of content concentration is negative while the quadratic term is positive. This implies that advertisers either like magazines that are either very diversified in content or that are very narrow, presumably since there are two types of advertisers: those who have a heterogenous consumer base and those who have a homogenous consumer base.

Table 4 also shows highly significant time trends. Advertising rates have been significantly higher in the years 1998–2000 compared to 2001.

The adjusted R^2 is 0.96 and hence very high. This is likely due to the comparatively low

number of observations in the estimation and the comparatively low within variations in the dependent and explanatory variables, an issue that is also valid for the other estimations.

Insert Table 4 about here!

4.2 Magazine demand equation

Estimation results for the magazine demand equation are shown in Table 5. The coefficients on price, the α's, are jointly highly significantly different from zero. Magazine readers with no own income are most price sensitive. The least price elastic readers are those with an income above 3,000 DM and between 2,000 and 2,500 DM.

The point estimate of the within–group correlation coefficient σ is 0.6 and hence large, suggesting that magazines are indeed very similar within groups.

Consumers like magazine that either come with many content pages or with few. There seems to be a demand–maximizing share of advertising pages as indicated by the positive coefficient on advertising pages and the negative coefficient on advertising pages squared. The demand–maximizing advertising share is, however, 4.87 and hence far outside the relevant range. This in fact suggests that consumers have a taste for advertising.

Content shares are jointly highly significant determinants of magazine demand. In contrast to the results for advertising rates, magazine readers have a taste for "some" content concentration as indicated by the positive sign of the linear content concentration variable and the negatively signed squared content concentration. The magazine demand maximizing content concentration is 0.17 which is to be compared to a mean concentration of

0.2.

There are highly significant effects of time on magazine demand, both within and between years.

The adjusted R^2 is 0.92 and hence again very large.

Insert Table 5 about here!

4.3 Marginal cost equation

Estimation results for marginal cost are shown in Table 6. The estimation results for marginal cost indicate highly significant and quantitatively large returns to scale. The point estimate for the effect of total circulation suggests a decrease of 11.1 percent in marginal cost due to a one percent increase in circulation. Likewise for the total number of pages produced by the own publishing house: one percent increase here leads to a 27.1 percent decrease in marginal cost.

There is no clear evidence for scope effects. There is a concave effect of the number of titles published by the own publisher — marginal cost are low if the number of titles by the own publisher is either low or high. The cost–maximizing number of titles by the own publisher is 3.2 which is just a little below the mean of four titles.

Consistent with my a priori expectations, the total number of pages and fashion pages both have significantly positive effects on marginal cost. The printing technique dummies also carry the expected signs: deep printing is cheaper than both offset print and a mix of both deep print and offset print.

Highly significant quarter and year effects are also found. The adjusted R^2 is 0.69 and

hence large in absolute terms.

Insert Table 6 about here!

4.4 Internal validation

A somewhat natural "test" of model validity is to validate the estimates for marginal cost internally (which I do right below) and externally (which I do in the following subsection). A first internal check of the model is that it should not generate negative marginal cost. Positivity is *not* guaranteed by construction since marginal cost are backed out from Equation (9) so that obtaining negative marginal cost is possible in principle. I indeed find negative marginal cost for three magazines for short time periods "Die neue Frau" (negative marginal cost in period I/2000—I/2001), "Laura" (I/1996) and "Neue Woche" (I/2001—III/2001). Although negative marginal cost clearly speak against the model, I do not think that these few observations generally make a strong point against my model. Apart from the fact that negative marginal cost relate to 8 out of 860 observations only, all three magazines are market entrants — "Neue Woche" entered in I/2000, "Die neue Frau" entered in I/2000 and "Laura" entered in I/1996 — and the estimated negative cost closely correspond to the point in time when they entered. Naturally, the new market entrants come with a comparably low number of advertising pages so that determinants other than those captured by my model might be important.

A second informal test is that the coefficient estimates in the marginal cost estimation as shown in Table 6 "make sense", they carry the expected sign and are also quantitatively plausible.

A third indicator for model validity is that those magazines that make losses on the magazine reader market are those where the reaction of advertising rates caused by changes in cover prices (via changes in circulation) is particularly strong. In other words: magazines where marginal cost are below cover price are those with the largest advertising rate elasticity with respect to cover prices, $\frac{\partial p^a}{\partial p^c}\frac{p^c}{p^a}$. This is shown in Table 7. All figures in Table 7, which also contains estimates for the markups and price–cost margins, are per issue and refer to the 4th quarter of 2001. Interestingly, the most advertising rate elastic magazine with respect to cover prices, "Amica" decreased its cover price by one Euro (or one third of the cover price) in May 2002 (outside my observation period). According to a report in the business press "Amica", did so after having experienced decreases in circulation and dramatic drops in advertising demand.

All magazines make profits before fixed cost at any point in time (see Table 7). "Prima Carina" and "Frau im Leben", however, make the lowest within group before fixed cost profits. "Prima Carina" dropped out of the market in III/1999, which I consider as a fourth sign of model validity.

4.5 External validation

Since cost information is probably the best kept information in any industry, an external model validation is hard to perform, and what I do below might even be considered as an exercise in comparing apples and oranges. Indeed, the lack of cost data is the main reason why economists wish to estimate marginal cost in the first place. After a thorough internet search and several inquiries at publishing houses and firms from the printing industry, I obtained data on marginal cost for four German magazines.

Marginal cost for two of these four magazine were obtained from the internet. They correspond to "Der Schnitt" and "Filter", both are cinema magazines that are quite comparable the women's magazines analyzed here in terms of circulation and the number of pages. According to Gangloff (2001), who cites the editor–in–chief of "Der Schnitt", the printing cost per copy of this magazine is 0.92 Euro. A business plan of "Filter", a magazine that is financed by a venture capitalist, shows that the editors estimate that printing costs per copy are 0.76 Euro (Filter 2001). The upper part of Table 8 compares these marginal cost estimates gathered from industry sources with the estimated marginal cost to those magazines that come closest to 'Der Schnitt' and 'Filter' in terms of the number of pages and in terms of circulation. One markedly distinguishing feature between the two cinema magazines and the women's magazine is that the former ones are published by large publishing houses as the women's magazine are. Instead they are published by private individuals who contract independent printing firms to produce the magazines. With regard to my finding of large economies of scale, production cost of the two cinema magazines should be markedly below those for the women's magazines — and they are indeed are as shown in Table 8.

While comparing the two niche cinema magazines to the popular women's magazines might in fact be an exercise in comparing apples and oranges, comparing magazines "X" and "Y" (whose identity I am not allowed to reveal) and the other magazines listed in the lower panel of Table 8 comes closer to "real" cost comparisons since both magazines are published by major players in the German magazine market. It is questionable, however, how exactly the persons that communicated the marginal cost information to me were aware of the exact marginal cost themselves. The comparison in the lower panel of Table 8 shows that my marginal cost estimates tend to be lower than the marginal cost

of magazines “X” and “Y”.

While it is clearly questionable if the evidence presented in Table 8 is really more than just a comparison of apples and oranges, the comparison at least indicates that my marginal cost estimates are not very far off reality — they might indeed reality very well.

5 Conclusions

This paper derives and estimates a model for the German magazine market. The model underlines the importance of taking into account the two–sidedness of magazine markets. In order to be successful, magazines need to take to two types of consumers on board: magazine readers and advertisers. Advertisers value large circulation so that even a magazine monopolist would never charge ‘true’ monopoly cover prices since advertising rates depend on circulation which in turn decreases if cover prices increase. Cover price increases hence cannibalize advertising revenue in the magazine market.

The theoretical model consists of three equations: a behaviorial equation for advertising rates, an equation for magazine demand and a first order condition for profit maximization from which I later back out estimates for marginal production cost.

A main — and unsurprising — results of the model is that the price–cost margin is smaller the more circulation elastic advertising rates are and/or the higher advertising revenue per copy is. The model hence does not suggest strong incentives of merging for pure market power reasons: any price increase is (over–) compensated by losses in advertising revenue.

The theoretical model is then taken to data for German women’s magazines observed

between I/1996 and IV/2001. I find that many magazines cover price below marginal cost, and that especially those magazines whose advertising rates particularly sensitively react to changes in copy prices do so. A merger that is purely driven by gains in market power that might lead to a higher markup is thus unlikely to be profitable — the increase in sales revenue would be smaller than the loss in advertising revenue. By contrast, my estimation results show that there are highly significant returns to scale in magazine production which imply incentives to merge on efficiency grounds.

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Table 1: Mean and standard deviations of key variables used in the estimations

		Mean	Std. dev.	Ratio
Circulation	overall	431886.1	344090.3	1.2552
	between		346551.5	1.2462
	within		24993.1	17.2802
Editorial	overall	637.1	199.1	3.1998
pages	between		198.7	3.2066
	within		30.5	20.8680
Advertising	overall	233.8	167.7	1.3942
pages	between		164.5	1.4213
	within		39.9	5.8596
Advertising	overall	0.2592	0.1295	2.0011
share	between		0.1274	2.0351
	within		0.0295	8.7931
Cover	overall	1.9365	1.1320	1.7107
price	between		1.1428	1.6945
	within		0.0276	70.2805
Advertising	overall	14470.9	9798.6	1.4768
rate	between		9894.8	1.4625
	within		0.0000	n.a.

Table 1 shows mean and standard deviations of key variables that are used in the estimations.

Table 2: Magazine grouping

	Circulation share	Circulation revenue	Advertising pages share	Advertising revenue
Monthly high priced magazines	3.6	10.1	17.0	16.2
Monthly medium priced magazines	11.7	18.3	20.5	18.6
Biweekly classical magazines	14.1	18.0	23.1	38.0
Weekly advise giving magazines	26.5	15.6	12.6	14.9
'Yellow' magazines	6.5	7.5	6.3	4.1
Girls' magazines	37.5	30.5	20.5	8.2

Table 2 shows some main figures on the magazine grouping I apply in the empirical analysis.

Table 3: Characteristics of copy price changes 1996–2002

	Mean	Std. dev.	Min.	10%	25%	Med.	75%	90%	Max
Price change	0.48	2.27	-23.91	0.00	0.00	0.00	0.00	0.00	19.92
Price change if change	5.71	5.63	-23.91	3.76	3.91	4.92	7.58	12.02	19.92
# of changes	2.75	1.40	1.00	1.00	2.00	3.00	4.00	5.00	6.00

Table 3 shows some descriptive statistics on changes in copy prices between I/1996 and IV/2001.

Table 4: OLS estimation results for advertising price Equation (4)

	Coeff.	p–value		Coeff.	p–value
Circulation elasticities (η)			**Content shares and concentration**		
Monthly high priced	0.2102	0.089	Fashion for purchase	1.8697	0.001
Monthly med. priced	0.7386	0.000	Self–made fashion	-0.6267	0.473
Biweekly classical	0.8274	0.000	Cosmetics	-0.7118	0.314
Weekly advise giving	0.8679	0.000	Cooking	0.1218	0.895
Yellows	0.6784	0.000	Interior design	0.0032	0.997
Girls	0.6353	0.000	Handicraft	-0.2913	0.776
Magazine group dummies			Children	-5.3290	0.000
Dummy monthly high priced	5.9953	0.000	Society	-1.5604	0.068
Dummy monthly med. priced	-0.3859	0.835	Partnership	-0.0511	0.937
Dummy weekly advise giving	-2.0244	0.128	Vacation	0.1754	0.866
Dummy yellows	-2.8305	0.011	Counselling	2.5256	0.021
Dummy girls	0.5808	0.686	Hobby	-0.4051	0.846
Advertising and content pages			Car	-1.3382	0.670
log(# of adpages)	-0.0285	0.561	Politics	-4.7554	0.004
log(# of ed. pages)	0.6611	0.000	Science	0.2743	0.761
Income shares and concentration			Art	1.8649	0.108
1,500–2,000 DM	0.9119	0.283	Sensation	5.8893	0.000
2,000–2,500 DM	0.8883	0.316	Fiction	-0.9269	0.054
2,500–3,000 DM	2.1821	0.029	Sexuality	3.0959	0.070
$>$ 3,000 DM	0.7236	0.357	TV	1.1634	0.075
no own income	-0.4948	0.334	Service pages	3.0461	0.016
Income concentration	0.3150	0.796	Content concentration	-0.1045	0.004
Age shares and concentration			Content concentration^2	0.2203	0.005
20–29	0.2913	0.612	**Year dummies**		
30–39	-1.0880	0.052	Year 1997	-0.0380	0.250
40–49	-0.6452	0.334	Year 1998	0.0837	0.009
50–59	1.6131	0.008	Year 1999	0.1148	0.001
60–69	0.1402	0.863	Year 2000	0.1631	0.000
$>$70	-0.8653	0.203	**Constant**		
Age concentration	1.3607	0.077	Constant	-4.4691	0.009
Wald tests for joint significance, adj. R^2 and number of obs.					
	Test stat.	p–value		Test stat.	p–value
Circulation elasticities	524.3387	0.000	Content shares	22.9658	0.346
Magazine group dummies	30.6246	0.000	Content concentration	8.1515	0.017
Income shares	8.6120	0.126	Year dummies	14.3461	0.001
Age shares	22.9658	0.001			
Adj. R^2	0.9566				
# of obs.	176				

Table 4 shows OLS regression results of Equation (4). The dependent variable is in natural logarithms so that coefficients corresponding to explanatory variables in natural logarithms are to be interpreted as elasticities and dummy variables are to be interpreted as percentage changes. Marginal significance levels (p–values) are calculated from a heteroscedasticity–robust and autocorrelation–robust variance–covariance matrix.

Table 5: GMM estimation results for magazine demand Equation (6)

	Coeff.	Std. err.		Coeff.	Std. err.
Price coefficients (α)			**Content shares and concentration**		
Income < 1,500 (α_1)	-0.4837	0.097	Fashion for purchase	-0.1392	0.880
Income 1,500–2,000 (α_2)	-0.7809	0.007	Self–made fashion	0.6256	0.533
Income 2,000–2,500 (α_3)	-0.0265	0.920	Cosmetics	-2.2248	0.001
Income 2,500–3,000 (α_4)	-0.8523	0.007	Cooking	0.5012	0.621
Income > 3,000 (α_5)	-0.0697	0.705	Interior design	-1.5745	0.038
No own income (α_6)	-1.1684	0.000	Handicraft	-1.5890	0.172
Within group market share			Children	-1.8310	0.090
σ	0.6020	0.000	Society	-2.6017	0.000
Content and advertising pages			Partnership	-0.4071	0.560
log(# of content pages)	-1.6947	0.043	Vacation	-0.5089	0.614
log(# of content pages)^2	0.1631	0.017	Counselling	-2.6475	0.019
Share of advertising pages	1.0307	0.002	Hobby	-4.5637	0.010
Share of advertising pages^2	-0.1057	0.572	Car	3.3503	0.079
Quarter dummies			Politics	-0.1377	0.953
1st quarter	0.1306	0.000	Science	-3.4442	0.001
2nd quarter	0.0279	0.168	Art	1.5691	0.503
3rd quarter	0.1388	0.000	Sensation	3.8564	0.183
Year dummies			Fiction	-0.1848	0.724
Year 1997	-0.0898	0.005	Sexuality	-1.3699	0.427
Year 1998	-0.1764	0.000	TV	-1.5484	0.013
Year 1999	-0.1905	0.000	Service pages	-0.5088	0.703
Year 2000	-0.2497	0.000	Content concentration	9.9288	0.072
Year 2001	-0.2591	0.000	Content concentration^2	-29.8968	0.010
			Constant		
			Constant	2.4020	0.368

Wald tests for joint significance, adj. R^2 and number of obs.

	Test stat.	p–value		Test stat.	p–value
Price coeff.	68.5926	0.000	Content share	120.7318	0.000
Content pages	59.1520	0.000	Content concentration	21.4460	0.000
Advertising shares	9.9229	0.007			
Quarter dummies	92.5990	0.000			
Year dummies	73.6293	0.000			
Adj. R^2	0.9153		# of obs.	860	

Table 5 shows GMM estimation results of Equation (6). Marginal significance levels (p–values) are calculated from a heteroscedasticity–robust and first–order autocorrelation–robust variance–covariance matrix.

Table 6: OLS estimation results for marginal cost Equation (9)

	Coeff.	Std. err.
Scale effects		
log(total circulation)	-0.1116 **	0.0479
log(total # of pages by own publisher)	-0.2710***	0.0832
Scope effects		
log(# of titles by own publisher)	0.6125***	0.1338
log(# of titles by own publisher)^2	-0.2652***	0.0551
Cost drivers		
log(# of fashion pages)	0.6434***	0.0411
log(physical size)	0.6310***	0.2148
log(# of pages)	0.7797***	0.1039
Printing technique		
Offset print	-0.0649	0.0996
Deep print	-0.7270***	0.1307
Quarter dummies		
1st quarter	-0.1210 *	0.0647
2nd quarter	0.0145	0.0674
3rd quarter	-0.1629 **	0.0673
Year dummies		
Year 1997	0.0541	0.0837
Year 1998	0.1527 *	0.0824
Year 1999	0.2406***	0.0751
Year 2000	0.2251***	0.0835
Year 2001	0.2296***	0.0880
Constant	-4.0212***	0.7992
Wald tests for joint significance, adj. R^2 and number of obs.		
	Test stat.	p–value
Print dummies	51.7312	0.0000
Quarter dummies	3.8754	0.0092
Year dummies	3.4578	0.0043
Adj. R^2	0.6907	
# of obs.	850	

Table 6 shows OLS regression results of Equation (9). The dependent variable is in natural logarithm so that coefficients corresponding to explanatory variables in natural logarithms are to be interpreted as elasticities and dummy variables are to be interpreted as percentage changes. Marginal significance levels (p–values) are calculated from a heteroscedasticity–robust and autocorrelation–robust variance–covariance matrix.

Table 7: Implied estimation results

	Cover price	'Usual markup'	Markup deterioration	Price–cost margin	Total revenue excl. fixed cost	$\partial p^a/\partial p^c$ p^c/p^a
Monthly high priced magazines						
Elle	4.04	0.3712	-3.7471	-0.1689	3,147,252	-0.9460
Madame	5.63	0.3811	-3.4484	0.1219	1,318,434	-1.3533
Marie Claire	3.58	0.3923	-1.7918	0.2757	1,096,540	-0.8858
Vogue	5.63	0.3835	-7.3761	-0.5754	3,205,831	-1.3619
Monthly medium priced magazines						
Allegra	2.56	0.4503	-6.1944	-1.5771	507,294	-2.5544
Amica	3.07	0.4725	-8.6188	-1.9868	956,624	-3.2143
Cosmopolitan	2.56	0.4162	-8.3802	-2.4443	1,125,049	-2.3612
Frau im Leben	1.99	0.5020	-0.3711	0.7325	103,681	-2.2138
Maxi	2.56	0.4787	-1.9023	0.1106	339,411	-2.7153
Petra	2.56	0.4561	-6.5661	-1.7200	895,886	-2.5876
Ratgeber Frau und Familie	2.04	0.4470	-0.3878	0.6957	193,659	-2.0206
Biweekly classical magazines						
Brigitte	2.04	0.1846	-5.0883	-1.5705	1,094,932	-1.8692
Freundin	2.04	0.2004	-6.2065	-2.1109	861,239	-2.0291
Für Sie	2.04	0.2134	-3.5436	-0.7991	483,475	-2.1615
Journal für die Frau	2.04	0.2181	-2.0406	-0.0601	218,382	-2.2086
Weekly advise giving magazines						
Bella	1.22	0.1222	-0.6199	0.5087	69,023	-1.5528
Bild der Frau	0.81	0.0926	-0.5711	0.3260	299,231	-0.7816
Laura	0.81	0.1182	-0.3811	0.5920	91,754	-0.9970
Lea	0.87	n.a.	-0.1265	n.a.	n.a.	n.a.
Lisa	0.81	0.1162	-0.3778	0.5936	95,808	-0.9802
Tina	1.22	0.1058	-0.5669	0.5387	195,558	-1.3441
Girls' magazines						
Bravo Girl	1.68	0.2795	-0.7612	0.5466	270,050	-1.9113
Brigitte Young Miss	2.2	0.6462	-2.7123	-0.2725	338,746	-2.8930
Joy	2.3	0.5230	-2.5385	-0.2097	241,841	-2.4479
Mädchen	1.68	0.2912	-0.6359	0.6281	191,578	-1.9910
'Yellow' magazines						
7 Tage	1.38	0.1072	-0.1728	0.8691	20,971	-1.1282
Das Goldene Blatt	1.38	0.1120	-0.1738	0.8719	49,739	-1.1778
Das Neue	1.38	0.1166	-0.0291	0.9801	55,270	-1.2267
Das Neue Blatt	1.38	0.1007	-0.1137	0.9073	161,779	-1.0595
Die Aktuelle	1.38	0.1100	-0.1573	0.8824	100,940	-1.1570
Die neue Frau	0.92	0.1240	-0.0788	0.9659	34,441	-0.8697
Echo der Frau	1.38	0.1135	-0.1831	0.8662	85,483	-1.1938
Frau aktuell	1.38	0.1156	-0.2103	0.8480	75,580	-1.2159
Frau im Spiegel	1.38	0.1091	-0.2507	0.8140	144,254	-1.1476
Frau mit Herz	1.38	0.1240	-0.2217	0.8458	37,331	-1.3040
Heim und Welt	1.38	0.1099	-0.5765	0.5785	47,841	-1.1557
Neue Post	1.28	0.1059	-0.1074	0.9155	209,488	-1.0331
Neue Welt	1.38	0.1083	-0.1327	0.8990	72,876	-1.1394
Neue Woche	0.87	0.1207	-0.0540	0.9933	74,938	-0.8008

Table 7 shows key results of interest that are implied by the model. $\partial p^a/\partial p^c p^c/p^a$ denotes the advertising rate elasticity with respect to cover prices. All figures correspond to the 4th quarter of 2001 and are per issue.

Table 8: Comparison of estimated and "true" marginal cost

	Circulation per issue	Pages per issue	Marginal cost per issue	Cover price
Der Schnitt	12,000	60	0.92	1.3
Filter	20,000	80	0.77	1.4
7 Tage	8,464	73	0.18	1.38
Frau mit Herz	12,382	77	0.21	1.38
Heim und Welt	9,044	78	0.58	1.38
Magazine X	[58.000;67.000]	[300;350]	3.60	[2.04; 2.55]
Marie Claire	51,318	219	2.59	3.58
Journal fr die Frau	56,532	173	2.16	2.04
Brigitte Young Miss	58,440	159	2.80	2.2
Allegra	64,001	291	6.60	2.56
Magazine Y	[25.000;29.000]	[250;300]	4.00	[3.06; 3.57]
Madame	32,959	255	4.94	5.63
Vogue	38,042	393	8.87	5.63

Table 8 compares estimated and "actual" marginal cost with one another. Cost data and prices are in Euros. All figures correspond to the 4th quarter of 2001.

Appendix A: descriptive statistics for advertising rate estimation

	Mean	Std. dev.
Dependent variable		
$ln(p^a_{jt})$	9.4232	0.6599
Circulation		
ln(circulation)	12.8443	0.7231
Group dummy variables		
Dummy monthly high priced	0.1136	
Dummy monthly med. priced	0.1932	
Dummy weekly advise giving	0.1420	
Dummy yellows	0.0966	
Dummy girls	0.3409	
Advertising and content pages		
Share of advertising pages	5.3779	0.7067
log(# of ed. pages)	8.0859	0.3767
Income shares		
1,500–2,000 DM	0.1605	0.0441
2,000–2,500 DM	0.1377	0.0298
2,500–3,000 DM	0.0858	0.0251
> 3,000 DM	0.1023	0.0444
no own income	0.2056	0.1014
Income concentration	0.2178	0.0447
Age shares and concentration		
20–29	0.1578	0.0904
30–39	0.1732	0.0606
40–49	0.1498	0.0392
50–59	0.1529	0.0562
60–69	0.1295	0.0775
>70	0.1351	0.1063
Age concentration	0.3094	0.0745
Content shares and concentration		
Fashion for purchase	0.1475	0.1175
Self–made fashion	0.0106	0.0308
Cosmetics	0.0547	0.0334
Cooking	0.0794	0.0581
Interior design	0.0358	0.0263
Handicraft	0.0155	0.0178
Children	0.0116	0.0125
Society	0.0702	0.0272
Partnership	0.0424	0.0374
Vacation	0.0526	0.0231
Counselling	0.0230	0.0159
Hobby	0.0069	0.0057
Car	0.0037	0.0041
Politics	0.0064	0.0093
Science	0.0302	0.0243
Art	0.0312	0.0310
Sensation	0.0104	0.0112
Fiction	0.1150	0.0874
Sexuality	0.0021	0.0061
TV	0.0096	0.0221
Service pages	0.0541	0.0165
Content concentration	0.1969	0.0466
Year dummies		
Year 1997	0.1875	
Year 1998	0.2102	
Year 1999	0.2045	
Year 2000	0.2159	

Appendix B: descriptive statistics for magazine demand estimation

	Mean	Std. dev.
Dependent variable		
$ln(s_{jt}/s_{0t}$	-3.8430	0.7266
Advertising and content pages		
Share adpages	0.2696	0.1257
log(# of ed. pages)	6.3660	0.3970
Income shares		
1,500–2,000 DM	0.3076	0.0507
2,000–2,500 DM	0.1581	0.0441
2,500–3,000 DM	0.1384	0.0313
$>$ 3,000 DM	0.0878	0.0259
no own income	0.1017	0.0453
Income concentration	0.2064	0.1049
Content shares and concentration		
Fashion for purchase	0.1469	0.1171
Self–made fashion	0.0099	0.0294
Cosmetics	0.0554	0.0335
Cooking	0.0800	0.0585
Interior design	0.0361	0.0261
Handicraft	0.0160	0.0185
Children	0.0113	0.0124
Society	0.0711	0.0281
Partnership	0.0434	0.0394
Vacation	0.0528	0.0231
Counselling	0.0231	0.0160
Hobby	0.0067	0.0066
Car	0.0040	0.0049
Politics	0.0063	0.0090
Science	0.0290	0.0241
Art	0.0309	0.0306
Sensation	0.0098	0.0109
Fiction	0.1147	0.0871
Sexuality	0.0019	0.0057
TV	0.0093	0.0213
Service pages	0.0540	0.0166
Content concentration	0.1974	0.0469
Quarter dummies		
1st quarter	0.2494	
2nd quarter	0.2494	
3rd quarter	0.2506	
Year dummies		
Year 1997	0.1875	
Year 1998	0.2102	
Year 1999	0.2045	
Year 2000	0.2159	

Appendix C: descriptive statistics for marginal cost estimation

	Mean	Std. dev.
Dependent variable		
$\ln(p^c_{jt} - mc_{jt})$	1.4088	1.1868
Scale effects		
log(total circulation)	12.8433	0.7143
log(total # of pages by own publisher)	7.8293	0.8598
Scope effects		
log(# of titles by own publisher)	1.1627	0.7029
log(# of titles by own publisher)^2	1.8453	1.5202
Cost drivers		
log(# of fashion pages)	4.3563	1.0989
log(physical size)	1.8140	0.0982
log(# of pages)	6.6961	0.3818
Printing technique		
Offset print	0.1885	
Deep print	0.6736	
Quarter dummies		
1st quarter	0.2494	
2nd quarter	0.2494	
3rd quarter	0.2506	
Year dummies		
Year 1997	0.1517	
Year 1998	0.1701	
Year 1999	0.1724	
Year 2000	0.1793	
Year 2001	0.1793	

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